NCVET

सूक्ष्म, लघु एवं मध्यम उद्यम मंत्रालय
DEVELOPMENT COMMISSIONER
MINISTRY OF MICRO, SMALL & MEDIUM ENTERPRISES
MSME TECHNOLOGY CENTRE

Skill India
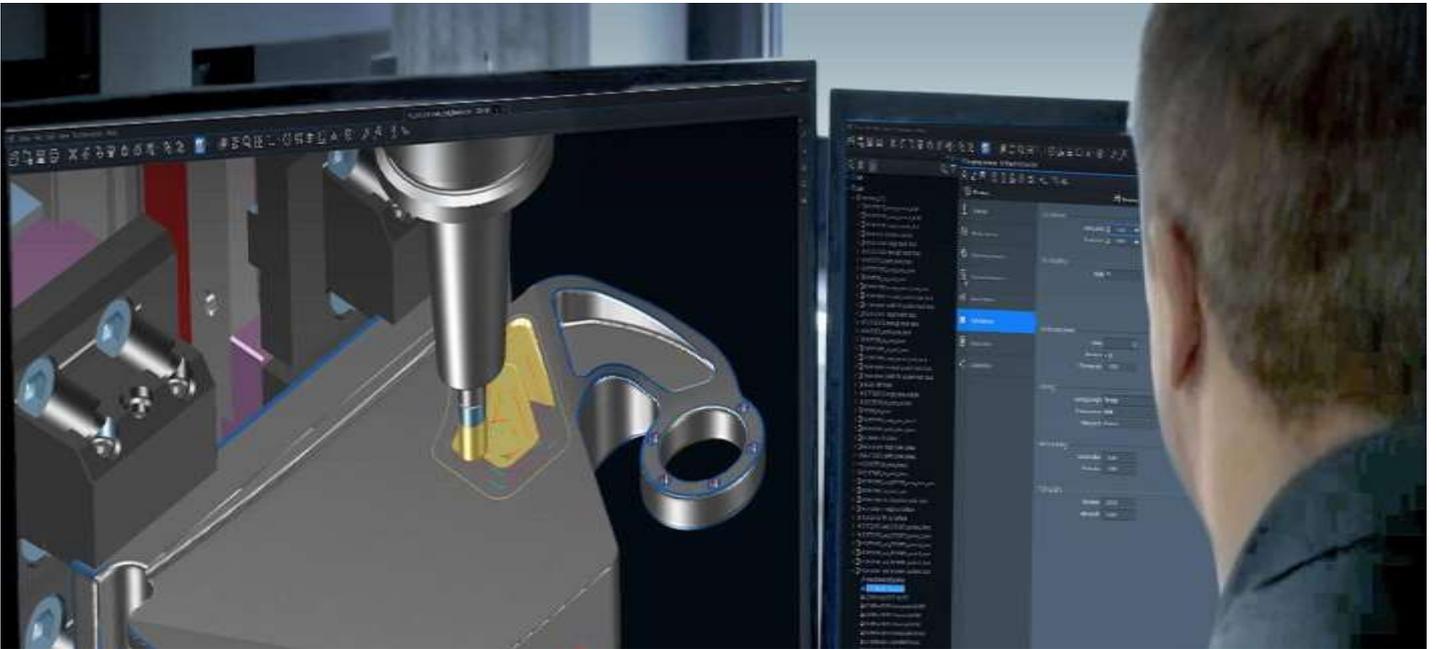कौशल भारत - कुशल भारत

MODEL CURRICULUM

Qualification Name:

TECHNICIAN -CNC MACHINING

Qualification Code: MSME/ACCCM/35

Version: 2.0

NSQF Level: 4.0

Model Curriculum Version: 2.0

Submitted By:

MSME TECHNOLOGY CENTRE

O/o DC MSME, Ministry of Micro, Small and Medium Enterprises

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<h1>NOS / MODULE TEMPLATE</h1>

NOS /Module: Fundamentals of CNC Technology

NOS /Module Code: MSME/ACCCM/01

Outcomes:

After completion of course Student should be able to:

1. Explain applications and advantages of CNC machines

2. Demonstrate and explain various CNC control, calculate technological data for CNC machining

3. Prepare and understand line program for various profile

4. Prepare programs, demonstrate, simulate and operate CNC machines for various machining operations

5. Perform basic maintenance activity on daily basis and prepare record of Machine break down

6. Manufacturing the parts by using DNC in CNC machine

Theory Hours: 60   **Practical Hours: NA**   **Theory Marks: 100**   **Practical Marks: NA**

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	TR Hours	TR Marks
UNIT-I	Introduction to CNC technology and Use of CNC Milling Simulation Lab	At the end of this Unit the student should be able to: • Generate the program of different milling operation. • Use simulator for all this operation and ensure the tool path by simulation	Introduction Of CNC Milling Machine, Advantage & Disadvantage , G & M-Codes For CNC Milling, Part Programming Fundamentals, Functional Keys & Steps To Write A Program, Contouring, Used Of Compensation, How To Prepare A Program, Chamfer, Circular Movement, Label Setting, Pocketing (Rectangular & Circular) ,Polar Movement, Peck Drilling, Mirror Cycle, Datum Shift.	30	50
UNIT-II	CNC Turning Simulation Lab	At the end of this Unit the student should be able to: • Generate the program of different turning operation. Also simulation of all this operation. Examination on practical.	Introduction of CNC lathe machine, advantage & disadvantage, g & m-codes for CNC lathe, homing process, rough turning cycle, facing, chamfer, circular movement, grooving, peck drilling, threading (internal & external),boring, CD, subprogram. Examination on theory.. Machining of programmed exercise on CNC lathe machines.Programming exercise. Machining of programmed exercise on CNC lathe & milling machines.	30	50

NOS /Module: Create CNC Programs and carry out CNC Machining operations

NOS /Module Code: MSME/ACCCM/02

Outcomes:

After completion of course Student should be able to:

1. Explain applications and advantages of CNC machines

2. Demonstrate and explain various CNC control, calculate technological data for CNC machining

3. Prepare and understand line program for various profile

4. Prepare programs, demonstrate, simulate and operate CNC machines for various machining operations

5. Perform basic maintenance activity on daily basis and prepare record of Machine break down

6. Manufacturing the parts by using DNC in CNC machine

Theory Hours: 30   Practical Hours: 120   Theory Marks: NA   Practical Marks: 100

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	TH & PR Hours	TH & PR Marks
UNIT-I	CNC Machining- Milling (Operation and Setup)	At the end of this Unit the student should be able to: •CNC Mill History •Different CNC Milling Operation the lathe operation	History, What Is CNC Machine, It's Advantages & Disadvantages, Parts Of CNC Machine, Cutting Tools, Controllers, Languages, Co-Ordinate System, Codes With Description, Axes Of CNC Milling , Machine's Origin Position, Work piece's Origins Position, Homing, Programming Procedure, Hands On Practice On CNC Panel Board, Zigzag Facing ,Contouring ,Pocketing ,Peck Drilling In Cartesian Co-Ordinate, Peck Drilling In Polar Co-Ordinate ,Milling With All Operation ,Slot Milling In Polar Co-Ordinates ,Datum Shift & Rotation. ● Practices on axis homing. Datum setting and tool offsetting. Zigzag facing operation, ● Tool Radius Compensation contouring operation by single depth of cut, Circular contouring operation by single depth of cut. Practices on contouring operation by incremental depth loop. ● Straight line and circular pocketing operation, tangential arc and polar contouring, drilling, polar drilling, boring, reaming. Practices on tapping operation. ● Datum shift operation, rotation operation, multi tool operation by using ACT,	75	50

			• Combination of all operations i.e. contouring, pocketing, drilling, combination of all operations double side. : Practices On DNC and CAM Post Processer Setup and Data Transmission		
UNIT-II	CNC Machining-Turning (Operation and Setup	At the end of this Unit the student should be able to: CNC Lathe History • Different CNC Turning Operation.	Parts Of CNC Machine, Cutting Tools, Controllers , Languages, Co-Ordinate System, Codes With Description, Axes Of CNC Milling , Machine's Origin Position, Work piece's Origins Position, Homing, Programming Procedure , Hands On Practice On CNC Panel Board, Simple Rough Cutting Cycles, Complex Rough Cutting Cycles With Finishing Cycle , Peck Drilling Cycle ,Complex Rough Cutting Cycles For Boring With Finishing Cycle, Face Grooving Cycle , Surface Grooving Cycle , External Threading Cycle , External Threading Cycle With All Operations. • Practice on panel board and axis homing. Job offset setting and Tool offsetting. Facing operation, • Plane turning operation. Practice on Step Turning operation, Tapper Turning operation, • Radius and Chamfer Turning operation, Drilling operation, Plane Boring operation. • Practices On Plane Boring operation, Step Boring operation, Tapper Boring operation, Radius and Chamfer Boring operation, External Grooving operation, Practices On Internal Grooving operation, External Thread Cutting operation, Internal Thread Cutting operation, Combination of all internal & external operations. Practices On Combination of all external & internal double side operations,	75	50

COURSES / MODULE TEMPLATE

NOS /Module: Create Part drawing using CAD Software

NOS /Module Code: MSME/ACCCM/03

Outcomes:

- After completion of course Student should be able to
- Explain the application of engineering drawing.
- Construct orthographic Projections giving proper dimensioning with title block using appropriate line type and scale for any geometrical figure in Auto CAD
- Explain various drawing Equipment's.
- Understand of Engineering Dimensioning method and their application
- Distinguish between Isometric view and Isometric projections.
- Explain about GD&T
- Create 2D geometric sketches by using Auto CAD Software
- Develop 3D modeling by using advanced command
- Understand design generative & interactive drafting

THEORY HOURS: - 30   PRACTICAL HOURS: 30   THEORY MARKS: -   PRACTICAL MARKS: 100

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	PR hours	PR Marks
UNIT-I	Introduction to auto cad	At the end of this Unit the student should be able to: • Understand CAD/CAM/CAE software. • Capability of Auto CAD • Use of various Visualization command • Documentation Quick tour • Create and Access documentation • Layout and plotting • Understand concept of hardware & software.	Capability of Auto Cad, Starting AUTOCAD ,Various Visualization commands, Documentation Quick tour, Creating and Accessing documentation, Layout and plotting, Concept of hardware & software, Design criteria, Geometric modeling, entities, 2D & 3D Primitives. Different Types of cad software. Also comparison of various CAD Software. CAD software features. Concept of hardware & software.	2	20
UNIT-II	Editing methods and controlling drawing display	At the end of this Unit the student should be able to: • AUTOCAD & interface • Setting new drawing. • Accessing command • Opening & saving existing file & function keys etc. • Work with Co-ordinates system and their type • Drawing Line, curve objects (Circle, Arc, Ellipse, elliptical arcs,) • Create solid filled areas- Regions, Hatch, Dot-nut, DD type	Create the replica of model using copy, array, Work with models in the modify toolbar, Work with Erase, Trim, Break, Break at point, Create mirror, fillet & chamfer, Execute dimensions through dimension style option Understand of design intent & edit the design intent, Identify Sketch Entities line arc, rectangle, circle etc., Use sketch settings, Use of Style toolbar (text style, Multilayer style etc.),Concept of creating single entity object, Perform Revision cloud and wipe out command	3	20

UNIT-III	Layer management	At the end of this Unit the student should be able to: ● Edit objects using the object property tool bar and various method ● Adjusting snap & Grid alignment using Ortho mode ● Use object snap and object tracking methods. ● Understand the concept and use of layers ● Work with Layer	Edit objects using the object property tool bar and various method, Concepts of layers, Create the layers by various line property., Extract the layers from the saved file by design Centre option, Application of layers on/off, Use of layers for block, text, dimension, freeze, lock. Work with snap & Grid alignment using Ortho modes, Define Attributes for variable text of block, Use of purge to eliminate the unused layers, blocks, Create title block using table option.	4	40
UNIT-IV	Basic Dimensioning, Geometric dimensioning & Tolerance.	At the end of this Unit the student should be able to: ● Need for Dimension ● Detailed discussion on Dimensioning and tolerance method in AUTOCAD ● Edit method ● Add text with various engineering symbols ● Concept of block, formation of block, Attribute definition ● DD attribute and edit block ● Insert, Modify, renaming block	● Use of linear dimensioning (Linear, Align, Ordinates), Use of circular dimensioning (Radius, Diameter, Arc length), Create Baseline dimension & continuous dimensions for linear & angular dimension. Identify the appropriate Tool to create and modify the model, Add text with various engineering symbols, Deform the object by scale, lengthen, stretching, extend, Change the orientation of the object by align, offset, rotate, Concept of standard dimension, Use of angular dimension, Use of leader with text, block reference, concepts of Block, create the Block, Write block & extract the block from saved block.	7	20
Unit V	Getting started with 3d & Working in 3d space"	At the end of this Unit the student should be able to: ● Concept of Isometric Drawing, axes and planes ● Defining the paper setting ● View ports ● Overview of 3D model ● Solid modeling in AutoCAD Surface modeling in AutoCAD	● Concept of Isometric Drawing, axes and planes, so-circle, Defining the paper setting ,Overview of 3D model, Solid modeling in AutoCAD(creating technique),Solid modeling in AutoCAD(editing and modification technique),Solid modeling in AutoCAD(editing and modification technique),Review of previous Class, Surface modeling in AutoCAD(creating, editing and modification	9	

			technique),Converting wire frame models in to surface mode		
Unit VI	Introduction to engineering drawing & drawing instruments	After completion of unit Student should be able to ● Explain applications and advantages of Engineering Drawing ● Understand and explain difference between Drawing and Engineering Drawing ● Demonstrate and explain various Drawing instruments ● Calculate Representative Understand and demonstrate method of dimensioning	● Introduction and importance of engineering drawing, difference between Drawing and Technical drawing, Drawing Instruments - their Standard and uses, types of pencils used in technical Drawing, Lines, Drawing of Geometrical Figures, Lettering and Numbering, Dimensioning , Free hand drawing, sizes and Layout of Drawing Sheets, Method of presentation, Symbolic Representation.	2	
Unit VII	Projections and plane:	After completion of unit Student should be able to ● Understand and explain the concept and importance of Plane and projection ● Understand between first and third angle of projection Use appropriate symbol in engineering drawing	● Introduction to projections and planes, types of projection, difference between first angle projection and third angle of projections, types of plane, symbols used in angle of projection, practical examples on plane and projections.	3	

COURSES / MODULE TEMPLATE

NOS /Module: Generate part Programs using CAM Tools.

NOS /Module Code: MSME/ACCCM/04

Outcomes:

The aim of this course student should be able to:

- Understand capabilities of CAM Software like Master CAM.
- Create 2D geometric sketches by using Master CAM.
- Understand 3D solid & surface terminology.
- Clarify the Concept of CNC Programming.
- Understand Post processing.

☐ Execute & generate various Milling, Lathe, EDM operations NC program

THEORY HOURS: -   PRACTICAL HOURS: 60   THEORY MARKS: -   PRACTICAL MARKS: 100

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	PR hours	PR Marks
Unit-I	Introduction To CAM	At the end of this Unit the student should be able to: • Understand capabilities of CAM Software like Master CAM. • Understand scope of software. • Understand difference between • CAM/CAD/CAE software. • Understand various CAM software compare • to Master CAM.	Capability of CAM Software and Introduction to Master CAM. Scope of CAM software in Market, advantages of CAM. Introducing CNC machining by using CAM. Distinguish between Various types of CAM software and Master CAM. CAD software, features. Concept of hardware & software.	10	20
Unit-II	2D Drawing & Modeling	At the end of this Unit the student should be able to: • Understanding 2D drawing. • Create basic geometry. • Execute editing, modification, creating features. • Understand brief Transformation feature. • Understand modify tool.	Introduction to master CAM environment. To Understanding 2D drawing. Creation of basic, geometry like Point, line, rectangle, arc, ellipse, helix, spline & polygon. Modify Like fillet, chamfer, Trim, Break, Join, Extend, Dragging spline to arc, control point l NURBS Spline, Break Drafting etc.	25	40

			Transformation of object - Mirror, Rotate, Translate,		
			Scale. Selection Methods Creating Groups / Masking		
			of entities / Assigning / Changing colors. Chain / Window / Area / Group / Delete / Undelete / Undo.		
			Transformation of object - Mirror, Rotate, Translate,		
			Scale.		
Unit-III	Tool path Generation	At the end of this Unit the student should be able to: • Understand 2D tool path generation. • Understand concept of CNC machining. • Perform & execute generate various milling • & Lathe operations. • Understand Post processing. • Understand NC program Transfer to machine..	2D Tool path generation. Concepts of Machining: CNC control basics, & coordinate systems, Selection of tool, tool parameters, Program Manager / Creation of 2D tool path: contour / Facing / Pocket. Compensations, Drilling parameters / 3D contour machining surface roughing methods.-Pocket / Parallel for 3D Surfaces And Solids. Various 3D machining surface finishing methods.3D machining surface roughing methods. Various 3D machining Surface finishing methods. Post Processing: Generating NC Files / Editing NC Files / Verification and Program generation for actual machining / verification / post processing / Job machining on CNC Milling Machine DMU 50 T simulation -Backlot / Solid NC Verification of material cutting and simulation .DNC Data I.e. NC Program Transfer to machine.	25	40

COURSES / MODULE TEMPLATE

NOS /Module: Employability Skills

NOS /Module Code: MSME/ES/01

Module Hours: 30

Refer Standard Curriculum developed by NCVET. (60-hours-MC-Employability-Skills_v4-DGT (1).pdf)